

# Utilization behavior

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## Abstract

Utilisation Behaviour (UB) denotes the appropriate usage of an object by a patient, however at an inappropriate situation. Patients are compelled by the visual, visual-tactile presentation to grasp and use the object kept in front of them. UB is observed in patients having unilateral or bilateral frontal lesions. It is considered to be an extension of magnetic apraxia, which is defined as bilateral manual grasping behavior. The proposed hypothesis is that in frontal lesions there is suppression of the inhibitory effect of frontal lobe on parietal lobe. Neurological models to explain this phenomenon to occur as a result of loss of inhibitory biological system within the brain. A disturbance of balance between the patient's dependence on and independence from the outside world is believed to be present in such cases. From a cognitive point of view, three models have been described. Since its first description by Lhermitte in 1983, UB remains to be an interesting neurological phenomenon. We present a case of UB in a patient of fronto-temporal dementia and also summarise the neurological and cognitive models that explain this behaviour.

## Key Words

Behavior, dementia, utilization

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*Ann Indian Acad Neurol 2015;18:235-237*

## Introduction

Utilization behavior is an interesting sign in the field of behavioral neurology and neuropsychology. It was first defined by French neurologist Lhermitte in 1983. It is also known as magnetic apraxia. Lhermitte in his initial paper described the lesion to have heterogenous location ranging from anterior right cortical-subcortical frontal lobe to ascending frontal gyrus.<sup>[1]</sup> Subsequent studies have found the culprit lesion in other areas of the brain such as caudate nucleus and thalamus.<sup>[2-4]</sup>

## Case Report

We are presenting a 58-year-old male, an office clerk by occupation who presented to our outdoor patient clinic

with 6 years history of fluctuating behaviour, forgetfulness, hypersexuality, and change in personality. On examination, the patient had a tendency to lift the reflex hammer and start scribbling on the table [see Video 1 and legend]. He also had glabellar tap sign positive. Patient had magnetic resonance imaging (MRI) of brain suggestive of frontal and temporal lobe atrophy [Figure 1a and b]. He had been placed on tablet donepezil and memantine. There has been no change in his condition in 6-month follow-up.

## Discussion

In utilization behavior, the patient tends to reach out and begin to automatically use objects in the visual field of their environment. Two important neurological mechanisms have been proposed to explain this phenomenon [Table 1]. One model by Denny-Brown and Chambers states that there are two competitive biological orientations, an excitatory one, dependent upon more posterior cerebral systems, and an inhibitory one, based upon anterior systems. Utilization behavior is due to impairment of the inhibitory orientation leading to a non-inhibition of the chain of behaviors.<sup>[5,6]</sup> The second model, as proposed by Goldberg states that the presence of two systems, medial and lateral, the distinction is based upon the differentiation of internally and externally guided actions, respectively. A lesion to the medial system (formed by supplementary motor area and cingulate cortex) would lead to a critical reduction of intended action, a result of which a dominance of externally driven actions would be observed.<sup>[7]</sup>

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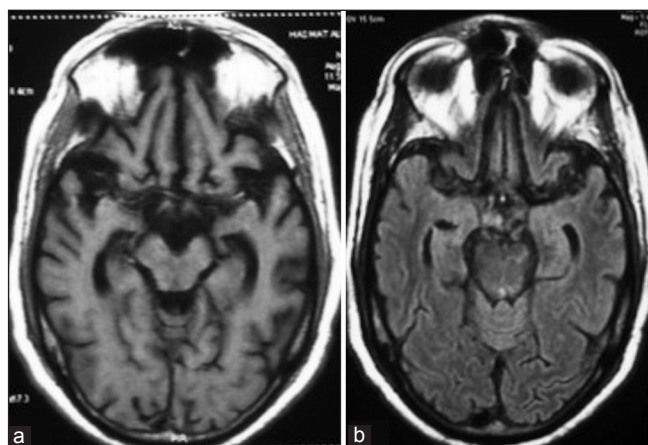


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10.4103/0972-2327.150613



**Figure 1: Magnetic resonance imaging of brain is suggestive of fronto-temporal atrophy on T1WI (a) and fluid attenuated inversion recovery (FLAIR) (b) consistent with a diagnosis of fronto-temporal dementia**

**Table 1: Proposed theories and localisation of utilization behaviour**

Authors	Proposed theory	Localisation
Denny Brown and Chambers	Loss of inhibitory/withdrawal tropism	Frontal, prefrontal and associative areas
Goldberg <sup>[7]</sup>	Loss of medial system causing loss of internally driven action (Goldberg)	Supplementary motor area, cingulate cortex

Different types of cognitive models have been proposed for utilization behavior, including the supervisory-attentional system (SAS), motor control system based upon engineering principles, and the social hypothesis. The SAS model consists of four modules including special purpose cognitive subsystems, schemata, supervisory attentional system, and contention scheduling.<sup>[8]</sup>

The patients who display utilization behavior tend to reach out and begin to automatically use objects in the visual field of their environment. For example, patient picks a toothbrush kept in front and starts to brush the teeth demonstrating an appropriate behavior at an inappropriate time. There are three ways to clinically elicit utilization behavior, namely induced utilization behavior, incidental utilization behavior, and verbal generation behavior. Induced method consists of putting an object in the hands of the patient and then observing for the behavior.<sup>[1]</sup>

Incidental method involves placing an object suddenly and not in front of the patient. It should not make the patient feel that he has to use it. The patient shall use the object when the object catches his attention.<sup>[9]</sup> Our patient had a tendency to lift the reflex hammer and start scribbling on the table suggestive of incidental form of utilization behavior [see Video 1].

In the verbal generation procedure, the patients are asked to describe various activities of daily living and during that time the examiner lets certain objects appear suddenly in front of the patient that may and may not be related to the activity

being described.<sup>[10]</sup> This results in utilization of the object by the patient and such a phenomenon is said to be produced by double activation where the stimulus to use the object is by vocal as well as visual input. In our patient, response to verbal generation procedure was inconsistent.

Utilization behavior as a clinical sign has been found to correlate with lesions of the frontal lobe. It can be used as a sign to indicate the involvement of frontal lobe in cases of dementia. It has also been found to be present in conditions such as attention deficit hyperactivity disorder, depression, cerebrovascular disease like moyo-moya disease and thalamic infarcts. Its particular usefulness could be found in certain scenarios such as presence of such a sign in an apathetic patient with a normal MRI scan would suggest an organic neurodegenerative cause rather than a functional cause. Exact percentage of patients with utilization behavior in frontal lobe abnormality is not available in the literature to the best of our knowledge; however, in a published study, utilization behavior and/or imitation behavior was found in 96% of the 29 patients with focal lesions of the frontal lobes. Imitation behavior is considered as first stage of utilization behavior and in this condition patients imitate examiner's gestures.<sup>[2]</sup>

Utilization behavior should not be confused with alien limb phenomenon which can be clinically distinguished easily as the patient with this phenomenon will say that he/she did not perform the given movement by himself. In terms of localization, alien limb phenomenon has been associated with lesion of supplementary motor area (SMA), anterior cingulate, and medial prefrontal cortex, particularly on the left, together with lesions of the anterior corpus callosum and secondly with a right frontal and/or anterior callosal lesion. In terms of mechanism, although both phenomenon are associated with loss of the capacity to inhibit stimulus-driven actions, however, patients of utilization behavior also lose the capacity to generate and act on endogenous intentions which is retained in alien limb phenomenon.<sup>[7,8]</sup>

However, saying so, it is not necessary to find utilization behavior in every case of frontal lobe dysfunction. Moreover, a mere presence of a single sign cannot be considered as hard evidence toward the presence of a disease. It is rather the presence of a number of other frontal release signs that give a strong indication towards presence of frontal lobe disease.

## References

1. Lhermitte F. 'Utilization behaviour' and its relation to lesions of the frontal lobes. *Brain* 1983;106:237-55.
2. Lhermitte F, Pillon B, Serdaru M. Human autonomy and the frontal lobes. Part I: Imitation and utilization behavior: A neuropsychological study of 75 patients. *Ann Neurol* 1986;19:326-34.
3. Degos JD, da Fonseca N, Gray F, Cesaro P. Severe frontal syndrome associated with infarcts of the left anterior cingulate gyrus and the head of the right caudate nucleus: A clinico-pathological case. *Brain* 1993;116:1541-8.
4. Spiegel DR, Lamm K. A case of utilization behavior and hyperorality following bilateral anterior cerebral artery infarct partially responsive to carbamazepine: Can both behaviors be attributed to lesions in different frontal lobe circuits? *Psychosomatics* 2011;52:563-7.

5. Mesulam MM. Frontal cortex and behavior. *Ann Neurol* 1986;19:320-5.
6. Denny-Brown D, Chambers RA. The parietal lobe and behavior. *Res Publ Assoc Res Nerv Ment Dis* 1958;36:35-117.
7. Goldberg G. Supplementary motor area structure and function. Review and hypotheses. *Behav Brain Sci* 1985;8:567-616.
8. Iaccarino L, Chieffi S, Iavarone A. Utilization behavior: What is known and what has to be known? *Behav Neurol* 2014;2014:297128.
9. Shallice T, Burgess PW, Schon F, Baxter DM. The origins of utilization behaviour. *Brain* 1989;112:1587-98.
10. Besnard J1, Allain P, Aubin G, Osiurak F, Chauviré V, Etcharry-Bouyx F, *et al.* Utilization behavior: Clinical and theoretical approaches. *J Int Neuropsychol Soc* 2010;16:453-62.

**How to cite this article:** Pandey S, Sarma N. Utilization behavior. *Ann Indian Acad Neurol* 2015;18:235-7.

**Received:** 24-09-14, **Revised:** 03-12-14, **Accepted:** 14-12-14

**Source of Support:** Nil, **Conflict of Interest:** None declared